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Continuous InSAR monitoring of Piton de la Fournaise Volcano (La Reunion Island): Four years of magmatic transfers revealed

P. Tinard (1), J.L. Froger (1), V. Cayol (1), P. Briole (2), Y. Fukushima (3), T. Staudacher (4) and T. Souriot (1)

(1) Lab. Magmas et Volcans, Université Blaise Pascal, 63038 Clermont-Fd Cedex, France

Since 2003, a systematic InSAR survey is performed on Piton de la Fournaise volcano (La Reunion Island) thanks to the ASAR-ENVISAT images. More than 230 images acquired in 6 different swathes, ascending and descending passes, allowed us to compute up to 1800 interferograms. From this InSAR database, a continuous and accurate monitoring of the 14 eruptions occurred since August 2003 to April 2007 was carried out; the inter-eruptive displacements were also monitored. This work also highlights all the potential and the efficiency of InSAR for monitoring active volcanoes. The modeling of the co- and inter-eruptive displacements is achieved using a three-dimensional mixed boundary element method coupled with a neighborhood algorithm. The co-eruptive displacements involve either eastward 50° to 70° dipping dykes (for most of the eruptions) or sub-vertical dykes for eruptions confined in the Dolomieu crater. The larger displacements observed during atypical eruptions (January 2004, February 2005 and December 2005) involve larger dykes migrating from the central cone towards the Plaine des Osmondes (4 km away) during 40 to 48 hours prior to eruption. The inter-eruptive displacements could match with the pulsing of a shallow magmatic reservoir roughly located at the sea level. We thank the European Space Agency for providing ASAR data through the EO-746 project